

Relativity Problems III

1. A particle flies by your desk at $0.98c$. If your desk is 2 meters long, how long does it take the particle to pass your desk, from the particle's frame of reference?
2. A spaceship flies by you at $0.95c$. You measure the time for the spaceship's length to pass you as 9×10^{-7} seconds. What is the proper length of the spaceship?
3. You are in a spaceship and fly by an observer at $0.8c$. According to your clocks, it takes 4.5×10^{-7} seconds for the length of your ship to pass the observer. How long does the observer measure your ship to be?
4. A spaceship flies by a landing strip at $0.7c$. People on the ship measure the landing strip to be 2.5 km long. How long does it take the spaceship to cross the landing strip, according to the people on the landing strip.
5. How fast, relative to the earth, would a person have to travel in order to reach the nearest star in only 2 years (according to the person doing the traveling) if the nearest star is 4 light years away (according to the earth.)?

Answers: 1) $1.35 \times 10^{-9} \text{ s}$ 2) 821 m 3) 64.8 m 4) $1.67 \times 10^{-5} \text{ s}$ 5) $0.89c$